

Attachment 1.11b

Maryland State Highway Administration Requirements

CATEGORY 100
PRELIMINARY

SECTION 104 — MAINTENANCE OF TRAFFIC

104.01 TRAFFIC CONTROL PLAN (TCP)

104.01.01 DESCRIPTION.

149 **DELETE:** The fourth paragraph sentence “Refer to contract Documents for Work Restrictions.” in its entirety.

INSERT: The following.

Work Restrictions. The Engineer reserves the right to modify or expand the methods of traffic control or working hours as specified in the Contract Documents. Any request from the Contractor to modify the work restrictions shall require written approval from the Engineer at least 72 hours prior to implementing the change. The Contractor shall submit a copy of the original work restrictions with the written request.

Work is not permitted on Saturdays or Sundays.

Work is not permitted on the holidays, or work day preceding and following holidays indicated below with an “X”:

- New Year's Day, January 1
- Martin Luther King's Birthday, the third Monday in January
- President's Day, the third Monday in February
- Good Friday
- Easter Weekend
- Memorial Day, the last Monday in May
- Independence Day, July 4
- Labor Day, the first Monday in September
- Columbus Day, the second Monday in October
- Veteran's Day, November 11
- Thanksgiving Day, the fourth Thursday in November
- Christmas Day, December 25

TEMPORARY LANE OR SHOULDER CLOSURE SCHEDULE			
ROADWAY	# LANE(S) / SHOULDER CAN BE CLOSED	DAY OF THE WEEK	CLOSURE PERIOD (TIME OF DAY)
US 29 (from Blair Rd to MD 97), (from Sligo Creek Pkwy to Howard Co)	0/0	Mon-Fri.	5am-9am
	1/1	Mon-Fri.	9am-3pm
	0/0	Mon-Fri.	3pm-8pm
	0/1	Sun-Thur	8pm-9pm
	1/1	Sun-Thur	9pm-12midnight
	1/1	Mon-Fri.	12 midnight - 5am
	2/1 (if at least 3 lanes in one direction)	Sun-Thur Mon-Fri.	10pm-12 midnight 12 midnight - 5am
US 29 (from MD 97 to Sligo Creek Pkwy), MD 27 (from MD 355 to Brink Rd)	0/0	Mon-Fri	5am-8am
	1/1	Mon-Fri	8am-10pm
	1/1	Sun-Thur	10pm - 12 midnight
	1/1	Mon-Fri.	12 midnight - 5am
	2/1 (if at least 3 lanes in one direction)	Mon-Fri.	12 midnight - 5am
I-270, I-270-Y, I-370, I-495 (from VA state line to MD 355),	0/0	Mon-Fri.	5am-9am
	1/1	Mon-Fri.	9am-3pm
	0/0	Mon-Fri.	3pm-9pm
	0/1	Sun-Thur	9pm-10pm
	1/1	Sun-Thur	10pm - 12 midnight
	1/1	Mon-Fri.	12 midnight - 5am
	2/1 (if at least 3 lanes in one direction)	Sun-Thur Mon-Fri.	11pm - 12 midnight 12 midnight - 5am
I-495 (from MD 355 to MD 650)	0/0	Mon-Fri	5am-9am
	1/1	Mon-Fri	9am-3pm
	0/0	Mon-Fri	3pm-8pm
	0/1	Sun-Thur	8pm-9pm
	1/1	Sun-Thur	9pm-12 midnight
	1/1	Mon-Fri.	12 midnight - 5am
	2/1	Sun-Thur	10pm-12 midnight
	2/1	Mon-Fri.	12 midnight - 5am
	<i>*Total Closure for PEPCO wiring across beltway</i>	<i>Mon-Fri.</i>	<i>1am-3am</i> <i>[off by 5am]</i>

SPECIAL PROVISIONS
 104.01 — TRAFFIC CONTROL PLAN

All other roads	0/0	Mon-Fri	5am-9am
	1/1	Mon-Fri	9am-3pm
	0/0	Mon-Fri	3pm-8pm
	1/1	Sun-Thur	8pm-12 midnight
	1/1	Mon-Fri.	12 midnight - 5am
	2/1 (if at least 3 lanes in one direction)	Sun-Thur	10pm-12midnight
		Mon-Fri.	12 midnight - 5am

149 **ADD:** The following after the last paragraph, “Any monetary savings...and the Administration.”

When closing or opening a lane on freeways, expressways, and roadways with posted speed \geq 55 mph, a work vehicle shall be closely followed by a protection vehicle (PV) during installation and removal of temporary traffic control devices. The PV shall consist of a work vehicle with approved flashing lights, either a truck-mounted attenuator (TMA) with support structure designed for attaching the system to the work vehicle or a trailer truck-mounted attenuator (TTMA) designed for attaching the system to the work vehicle by a pintle hook and an arrow panel (arrow mode for multilane roadways and caution mode on two-lane, two-way roadways).

The work vehicle size and method of attachment shall be as specified in the TMA/TTMA manufacturer’s specification as tested under NCHRP and/or MASH Test Level 3.

When a temporary lane or shoulder closure is in effect, work shall begin within one hour after the lane is closed. Any delay greater than one hour with no work in progress shall require the Contractor to remove the lane/shoulder closure at no additional cost to the Administration. The Contractor's Traffic Manager shall attend Pre-Construction and Pre-Paving Meetings and shall discuss traffic control and the Traffic Control Plan including procedures to be implemented for lane closures.

All closures shall be in conformance with the approved TCP and under the direction of the Contractor's Traffic Manager and the Engineer.

Workers and equipment, including temporary traffic control devices needed for setting up a lane closure or restriction, are prohibited in the lane/shoulder to be closed or restricted before the time permitted in the Contract work restrictions, unless otherwise noted below or as approved by the Engineer.

Temporary traffic control devices to be used for lane/shoulder closure may be placed on the shoulder of the roadway by workers no earlier than 30 minutes prior to actual time lane/shoulder closure or restriction is permitted. When temporary traffic control devices are being installed, all work vehicles involved in the installation shall display flashing lights that provide a 360-degree visibility of the vehicles. These lights shall remain on

SPECIAL PROVISIONS
 104.01 — TRAFFIC CONTROL PLAN

until the full installation of TTC devices is complete. Temporary traffic signs may be displayed to traffic at this time.

Workers shall not enter a lane open to traffic. Workers may be present on shoulders to prepare for lane closure setup no earlier than 30 minutes prior to actual time lane/shoulder closure or restriction is permitted. During preparation for the lane closure, all work vehicles present at the site and involved in the installation of the lane closure or restriction shall display flashing lights that provide 360-degree visibility of the vehicles. These lights shall remain on until the full implementation of the road closure or restriction is complete.

All temporary lane or shoulder closures shall be restored at the end of the closure period and no travel lane shall be reduced to less than 11 ft on expressways, freeways and 10 ft on other roadways. Prior to opening the closed lane or shoulder, the Contractor shall clear the lane or shoulder of all material, equipment, and debris.

Failure to restore full traffic capacity within the time specified will result in a deduction being assessed on the next progress estimate in conformance with the following.

This is in addition to the requirements specified in TC-4.02.

The designer shall identify the District (for freeways) or determine the Level of Service of the roadway (for other roads) and include the assessed deduction tables accordingly. All unnecessary tables should be deleted.

Level of Service may be determined by using the Congestion Assessment Maps obtained online at <http://shavmhisdwma/congestionassessmentintroduction/Default.aspx>

The lane closure penalties for freeways are categorized by the District in which they are located.

For Districts 1, 2 and 6, the following fee structure will be followed:

ASSESSED DEDUCTIONS FOR FREEWAYS	
ELAPSED TIME, (MINUTES)	DEDUCTION
<i>For 1 Lane Closures</i>	
1 – 10	\$ 100.00
Over 10	\$50.00 per minute (In addition to the original 10 minute deduction)
<i>For 2 or more Lane Closures</i>	
1 – 10	\$ 200.00
Over 10	\$100.00 per minute (In addition to the original 10 minute deduction)

For Districts 3, 4, 5 and 7, the following fee structure will be followed:

ASSESSED DEDUCTIONS FOR FREEWAYS	
ELAPSED TIME, (MINUTES)	DEDUCTION
<i>For 1 Lane Closures</i>	
1 – 10	\$ 1,000.00
Over 10	\$500.00 per minute (In addition to the original 10 minute deduction)
<i>For 2 or more Lane Closures</i>	
1 – 10	\$ 2,000.00
Over 10	\$1,000.00 per minute (In addition to the original 10 minute deduction)

The lane closure penalties for other roads are categorized by intersection Level of Service. The penalty for other roads with Level of Service D, E or F is greater than that for Level of Service A, B or C.

For Level of Service A, B or C, the following fee structure will be followed:

ASSESSED DEDUCTIONS FOR OTHER ROADS	
ELAPSED TIME, (MINUTES)	DEDUCTION
<i>For 1 Lane Closures</i>	
1 – 10	\$ 150.00
Over 10	\$75.00 per minute (In addition to the original 10 minute deduction)
<i>For 2 or more Lane Closures</i>	
1 – 10	\$ 300.00
Over 10	\$150.00 per minute (In addition to the original 10 minute deduction)

For Level of Service D, E or F, the following fee structure will be followed:

ASSESSED DEDUCTIONS FOR OTHER ROADS	
ELAPSED TIME, (MINUTES)	DEDUCTION
<i>For 1 Lane Closures</i>	
1 – 10	\$ 300.00
Over 10	\$150.00 per minute (In addition to the original 10 minute deduction)
<i>For 2 or more Lane Closures</i>	
1 – 10	\$ 600.00
Over 10	\$300.00 per minute (In addition to the original 10 minute deduction)

MEMORANDUM

TO: SENIOR MANAGEMENT

FROM: CEDRIC WARD, P.E., DIRECTOR
OFFICE OF TRAFFIC AND SAFETY 

SUBJECT: MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY
ADMINISTRATION LIGHTING DESIGN GUIDELINES 2018

DATE: MAY 16, 2018

**RESPONSE
REQUESTED
BY:** N/A

PURPOSE OF MEMORANDUM

To update the Maryland Department of Transportation State Highway Administration's (MDOT SHA) Lighting Design Guidelines.

SUMMARY

The Lighting Guidelines issued in 2013 need to be updated following results and recommendations from the National Cooperative Highway Research Program 828 regarding sign lighting. Interchange Lighting guidance is to be updated to clarify locations where additional interchange lighting should be implemented. Attached to this memorandum are the Lighting Design Guidelines 2018. The following is a summary of the updates:

Sign Lighting

- Overhead signs shall be fabricated with American Society of Testing and Materials (ASTM) Type XI sheeting and shall not be illuminated with sign lighting, except when less than 1,000 feet of unencumbered sight distance exists or when otherwise deemed necessary based on engineering judgement.
- The updated SN-1 (General Notes and Proposals) sheet shall be included when preparing signing plans, as the sign sheeting requirements have been updated.
- Existing overhead sign panels shall be replaced as necessary with ASTM Type XI sheeting when sign lighting is proposed to be removed.

Interchange Lighting

- Along roadway segments where 600 feet or less will exist between any two adjacent poles, additional lighting shall be installed to provide uniform levels in that segment.

All projects with a Final Review date on or after, July 1, 2018 should have accommodations made to incorporate the new requirements as outlined in the guidelines. Projects currently post Final Review stage or under construction should consider incorporating changes if pertinent bid items are in the existing contract and the project status allows for deletion of quantities without negative financial impact to the MDOT SHA.

If you have questions or concerns, please contact Jialin Tian, P.E., Deputy Director-Engineering and Operations, Office of Traffic and Safety, MDOT SHA at 410-787-5805 or via email at jtian@sha.state.md.us.

ATTACHMENTS

2018 Lighting Design Guidelines
SN-1 Sheet

Lighting Design Guidelines

April 2018

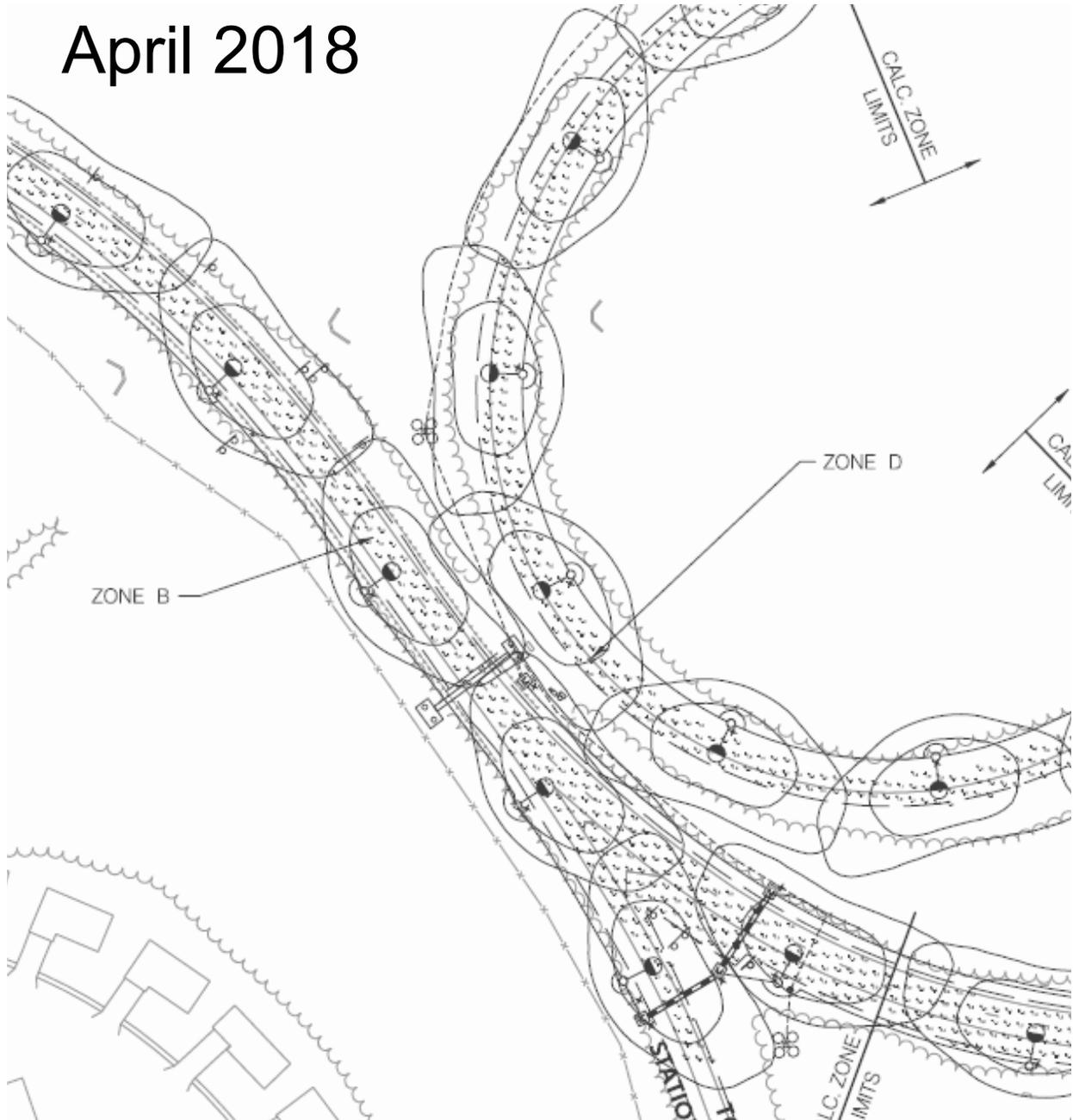


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I. INTRODUCTION

The Maryland Department of Transportation's State Highway Administration (MDOT SHA) lighting guidelines as described herein take into consideration factors such as traffic safety, light pollution, energy conservation, and maintenance. The proper selection of lighting equipment and the location of street lighting will provide sufficient visibility, increased safety, and improved security for motorists and pedestrians while maximizing energy efficiency and minimizing expenditure. Lighting also has adverse effects that include glare, light trespass and sky glow that should be considered when deciding to install roadway lighting. The Local Jurisdiction's commitment to participate in the design, construction, operation and maintenance of the lighting system should also be a consideration.

All new low level lighting such as interchange and intersection, underpass and sign lighting shall be designed using light emitting diode (LED) fixtures. The LED fixtures should also be considered for pedestrian lighting. The LED roadway fixtures shall be selected from the Qualified Products List (QPL).

The following guideline is separated into three sections:

- The ***Criteria for Eligibility*** section defines the circumstances which qualify a roadway to be considered for the installation of lighting.
- The ***Typical Lighting Applications*** section describes the common applications of lighting installations.
- The ***Special Lighting Applications*** section describes the various applications in relation to the roadways in which lighting shall be considered.

II. CRITERIA FOR ELIGIBILITY

To determine the eligibility for lighting installations, The MDOT SHA requires an engineering study of local conditions considering such factors as crash data, roadway characteristics and ambient light to support lighting installation decisions and to promote motorists and pedestrian safety. When there is a history of crashes, the type and circumstances of the crashes should also be considered in a study. Engineering judgment should be used in instances where an operational or safety concern is not indicated by the crash data. Traffic volumes can also be used as a supplemental measure in evaluating lighting eligibility. Furthermore, The American Association of State Highway and Transportation Officials (AASHTO) minimum conditions for when to consider lighting shall be used when determining eligibility for all lighting installations.

The conditions for eligibility for specific facility types are described in the following sections. Meeting these conditions does not obligate the MDOT SHA to provide lighting nor is it a requirement for installation of lighting in special circumstances.

III. TYPICAL LIGHTING APPLICATIONS

A. Interchange Lighting

Partial Interchange Lighting will be installed on all approaches at new and reconstructed grade separated interchanges across the state. At existing grade separated interchanges without interchange lighting; lighting will be installed based on an established need including night time crash history, site specific conditions and engineering judgement. Secondary ramp merges and diverges will be treated in the same manner as mainline exits. Figure III-A.1 in the Appendix should be used as a reference for lighting placements. The installation of additional lights is at the discretion of the MDOT SHA. For all lighting placements, the entering and/or exiting lane(s) and one (1) adjacent mainline travel lane shall be analyzed when determining proper spacing as shown in Figures III-A.2 and III-A.3 of the Appendix.

When new lighting, installed to meet these guidelines, results in less than 600 feet between any two light poles, additional lighting shall be installed to fill in this gap and to provide uniform levels in that section. Additional interchange lighting shall be considered on facilities with one or more of the following characteristics:

1. Ramps, interchange alignments, or grades which are complex or unusual. This includes ramps with substandard deceleration or acceleration lanes, full loops, compound curves, lane reductions and/or multi-lane ramps.
2. Locations with significant pedestrian or bicycle activities during times of darkness.
3. Important decision point(s) or existing roadside hazard areas that would not be covered with partial interchange lighting.
4. An operational analysis indicates the need for lighting. Volume and crash data should be used to support the analysis.

Refer to Table III-A.4 of the Appendix for recommended lighting values for interchanges. High mast lighting will not be installed along state roadways unless required lighting levels cannot be achieved with low level lighting and justified by an engineering study.

B. Intersection Lighting

Partial Intersection lighting will be installed at all locations meeting the following criteria:

1. All signalized intersections will have partial intersection lighting.
2. All roundabouts will have lighting (refer to Appendix Section III-B.1 for the MDOT SHA Roundabout Guidelines for placement and illuminance requirements).

3. All non-signalized intersections for which a need is determined based on the MDOT SHA Evaluation Form for Intersection Lighting. Refer to Figure III-B.2 of the Appendix for the MDOT SHA Evaluation Form for Intersection Lighting.

Lighting should be located on the downstream side of an intersection and coverage may include channelized (free) right turn lanes. See Figure III-A.1 of the Appendix for example lighting configurations. Where possible, the placement of the luminaire on a signal pole is preferred at signalized intersections. The conduit system for intersection lighting shall be dedicated for lighting only and shall not be shared with the signal cable unless the luminaire is mounted on the signal pole or otherwise directed by the MDOT SHA. Further, service pedestals may be shared for lighting and signals at the discretion of the MDOT SHA. Refer to Table III-B.3 of the Appendix for recommended lighting values for intersections other than roundabouts. Additional consideration should be given to intersections where continuous lighting is present; refer to IES RP-8-00 for more information.

C. Continuous Roadway Lighting

Continuous roadway lighting will not be installed along any state highway unless justified by an engineering study and approved in advance by the Director of the Office of Traffic and Safety (OOTS).

D. Sign Lighting

Overhead signs shall be installed with ASTM Type XI sheeting and shall not be illuminated with sign lighting, except under the following conditions:

1. All overhead signs with unencumbered sight distance of less than 1,000 feet. Unencumbered sight distance exists if all portions of every overhead sign panel on that structure is visible to motorists in all approaching lanes.
2. Additional lighting may be considered and requested as part of the Design Request based on engineering judgement to address site specific conditions.

Sight distance as noted above should be considered when selecting locations for new structures.

When sign lighting is provided:

1. Lighting shall consist of LED luminaires.
2. Individual supports for each luminaire is the preferred mounting method; sign lighting maintenance systems should only be used at the discretion of the OOTS.
3. All overhead sign panels mounted on a structure shall be illuminated. Lighting only select panels is not permitted.

Existing sign lighting, where required, will be upgraded to LED lighting as part of each project. When existing signs are replaced with new signs fabricated from Type XI sheeting, the need for sign lighting will be determined per the above criteria. If any overhead sign does not require lighting it shall use Type XI sheeting which shall be specified on the sign detail sheets.

IV. SPECIAL LIGHTING APPLICATIONS

A. Bridge Lighting

Bridge lighting will be evaluated using the Roadway Lighting criteria provided above, particularly the approach transition areas, with the following exceptions:

1. Existing bridge lighting which will not be impacted by a roadway project may remain in place.
2. Existing continuous roadway lighting not required to light the existing roadway at the approach of and along bridges should be removed.
3. Pedestrian Lighting on bridges will be installed in accordance with the MDOT SHA's Pedestrian Lighting Policy.
4. Decorative lighting should not be installed on bridges without sidewalks. When a sidewalk is present, the installation of lighting should be in accordance with the MDOT SHA's Pedestrian Lighting Policy. Decorative lighting should not be installed without a Memorandum of Understanding (MOU) which assigns responsibility for maintenance to Local Jurisdictions or utility companies.
5. All other lighting applications shall be determined as per the discretion of the OOTS.

B. Rest Area or Park-and-Ride Lots

Sufficient illumination shall be provided for public safety purposes at both rest areas and park-and-ride lots. Refer to Table IV-B.1 of the Appendix for recommended Illuminance Levels for Roadway Rest Areas and Table IV-B.2 of the Appendix for recommended Illuminance Levels for Parking Areas. Access ramps to and from the facility should be treated as interchange ramps and illuminance values as defined in Section III-A of this document.

C. Underpass Lighting

Underpass lighting shall be designed, for nighttime hours, in accordance with Table IV-C.1 of the Appendix where sidewalks are present. The need for daytime lights will be based on an Engineering Study, which includes consideration of existing light levels.

D. Tunnel Lighting

Tunnel lighting shall be designed in accordance with the Illuminating Engineering Society RP-22, American National Standard for Tunnel Lighting.

E. Pedestrian Lighting

The design and installation of pedestrian lighting is directed by the 2008 Maryland Department of Transportation State Highway Administration's Pedestrian Lighting Policy (Section IV-E.1 of Appendix). For Recommended Values for High, Medium and Low Pedestrian Conflict Areas see Tables IV-E.2, IV-E.3 and IV-E.4 of the Appendix. Where pedestrian lighting is installed along a roadway the veiling luminance along the roadway, per Table III-A.4 of the Appendix, shall not be exceeded.

F. Knock Downs

When a light pole is knocked down, maintenance forces should verify with the OOTS if the pole shall be replaced. If replacement of the pole is necessary, the existing fixture shall be upgraded with an LED fixture.

G. District Initiated Lighting Reductions

Districts are encouraged to review their existing lighting systems and consult with the OOTS to determine if reductions are possible. Funding for such reduction projects may be provided by the OOTS.

H. Temporary Lighting

During construction, temporary lighting should be provided for decision points. During design of the project, it should be determined if existing/proposed light poles will sufficiently illuminate conflict points, otherwise, temporary light poles (typically wood poles with overhead feeds) should be provided. Wood poles must be protected from vehicular traffic.

LIST OF APPENDICES

- Section I-A.1: Light Emitting Diode (LED) Roadway Lighting Specifications and Approved Luminaires Memo (*December 8, 2012*)
- Figure III-A.1: Examples of Lighting Configurations
- Figure III-A.2: Analysis Area for Entrance Ramps
- Figure III-A.3: Analysis Area for Exit Ramps
- Table III-A.4: Recommended Lighting Values for Interchanges
- Section III-B.1: Maryland State Highway Administration Roundabout Design Guidelines (Chapter 3)
- Table III-B.2: Maryland State Highway Administration Evaluation Form for Intersection Lighting
- Table III-B.3: Recommended Maintained Illuminance Values for Intersections other than Roundabouts
- Table IV-B.1: Recommended Illuminance Levels for Roadway Rest Areas
- Table IV-B.2: Recommended Maintained Illuminance Values for Parking Areas
- Table IV-C.1: Recommended Lighting Values for Pedestrian Portion of Underpasses with Walkways/Bikeways
- Section IV- E.1: Maryland State Highway Administration Pedestrian Lighting Policy
- Table IV-E.2: Recommended Maintained Illuminance Values for High Pedestrian Conflict Areas
- Table IV-E.3: Recommended Maintained Illuminance Values for Medium Pedestrian Conflict Areas
- Table IV-E.4: Recommended Maintained Illuminance Values for Low Pedestrian Conflict Areas



Lighting Design Guidelines

Section I-A.1

Maryland State Highway Administration Light Emitting Diode (LED) Roadway Lighting Specifications and Approved Luminaires Memo



Martin O'Malley, *Governor*
Anthony G. Brown, *Lt. Governor*

Darrell B. Mobley, *Acting Secretary*
Melinda B. Peters, *Administrator*

MARYLAND DEPARTMENT OF TRANSPORTATION

MEMORANDUM

TO: All District Engineers

Mr. Earle Freedman, Director
Office of Structures

Mr. Kirk McClelland, Director
Office of Highway Development

Mr. Russell Yurek, Director
Office of Maintenance

FROM: Gregory D. Welker
Deputy Administrator/Chief Engineer for Operations

DATE: December 7, 2012

SUBJECT: Light Emitting Diode (LED) Roadway Lighting
Specifications and Approved Luminaires

The State Highway Administration (SHA) is working to reduce energy usage in our agency by 20% from our 2011 levels by the year 2015. With advances in technology, the efficiency and compatibility of newer light sources has significantly improved. The use of light emitting diodes (LED's) as a source for roadway lighting can offer energy savings as compared to conventional high intensity discharge (HID) light sources, such as high pressure sodium (HPS) or metal halide (MH).

The SHA's Office of Traffic and Safety (OOTS) initiated an LED Roadway Lighting Pilot Study in October 2011 at the I-83/Warren Road Interchange. The purpose of the study was to research, analyze and document the energy efficiency and operational performance of LED roadway lighting. The study concluded that the LED roadway lighting technology has adequately evolved and can provide energy savings for lighting performance similar to conventional HID light sources. In addition, LED roadway lighting offers advantages such as cooler/natural light output, faster lamp start up time and less maintenance needs as compared to conventional HID light sources.

In view of these benefits, LED luminaires will be required on all future roadway lighting projects. Special Provision Inserts (SPI) 806 and 950.12 shall be included in the information for bid (IFB) package for all future roadway lighting projects. SPI's 806 and 950.12 cover the performance and materials aspect of LED luminaires, respectively.

My telephone number/toll-free number is **410-545-0360 or 1-888-204-0132**
Maryland Relay Service for Impaired Hearing or Speech 1.800.735.2258 Statewide Toll Free

Street Address: 707 North Calvert Street • Baltimore, Maryland 21202 • Phone 410.545.0300 • www.roads.maryland.gov

LED Roadway Lighting
December 7, 2012
Page Two

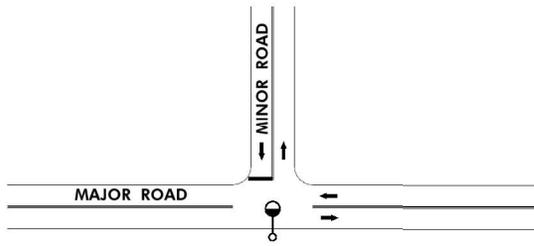
All projects currently in design that include non-LED roadway lighting should incorporate LED luminaires.

LED luminaire bid items will be required on all future roadway lighting maintenance projects. These should include items for repair/replacement of LEDs, and for replacing damaged conventional lighting with LED lighting. For existing lighting maintenance contracts, the respective District Offices may negotiate change orders for the contractors, to furnish and install LED luminaires. LED luminaires shall be used for all maintenance replacements. Maintenance of existing lighting shall be in accordance with SHA standards and any removal of existing, unwarranted lighting shall be coordinated with the OOTS.

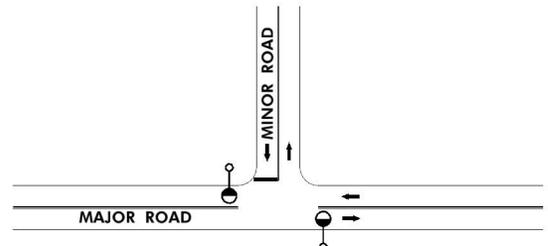
All approved LED roadway luminaires will be included on the Office of Traffic and Safety's Qualified Product's List (QPL). Only LED roadway luminaire models selected from the QPL shall be used on roadway lighting projects.

If you have any questions or require additional information, please do not hesitate to contact Mr. Michael L. Paylor, P.E., Chief, Traffic Engineering Design Division at 410-787-4027 or mpaylor@sha.state.md.us.

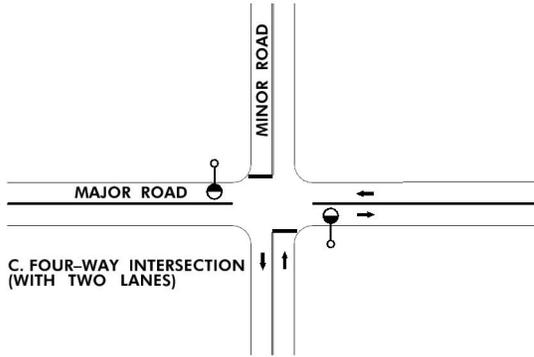
cc: Mr. Steven Marciszewski, Director, Office of Construction, SHA
Mr. Michael L. Paylor, P.E., Chief, TEDD, SHA
Mrs. Melinda Peters, Administrator, SHA
Mr. Douglas Simmons, Deputy Administrator/Chief Engineer for Planning, Engineering, Real Estate & Environment
Mr. Cedric Ward, P.E., Director, Office of Traffic and Safety, SHA



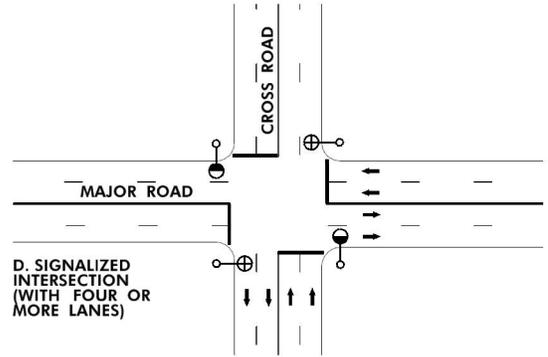
A. T-INTERSECTION



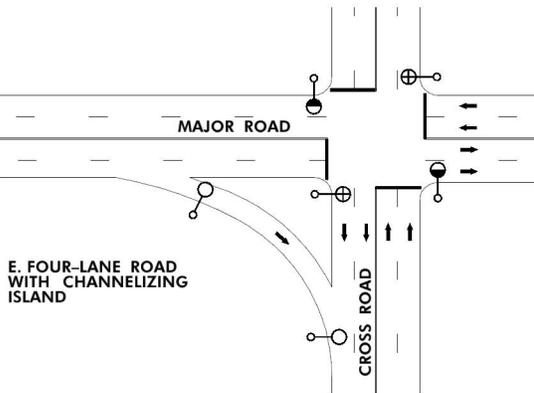
B. T-INTERSECTION (ALTERNATE)



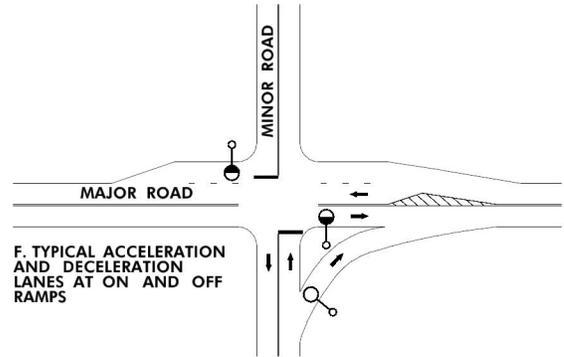
C. FOUR-WAY INTERSECTION (WITH TWO LANES)



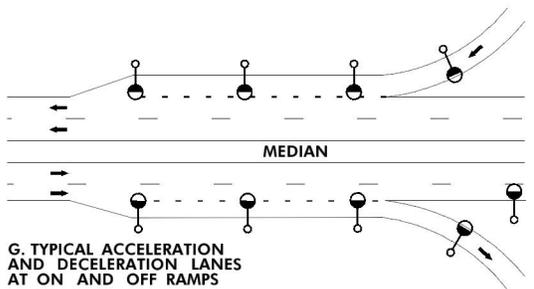
D. SIGNALIZED INTERSECTION (WITH FOUR OR MORE LANES)



E. FOUR-LANE ROAD WITH CHANNELIZING ISLAND



F. TYPICAL ACCELERATION AND DECELERATION LANES AT ON AND OFF RAMP



G. TYPICAL ACCELERATION AND DECELERATION LANES AT ON AND OFF RAMP

LEGEND

- UNIT REQUIRED
- ⊕ UNIT RECOMMENDED
- UNIT OPTIONAL

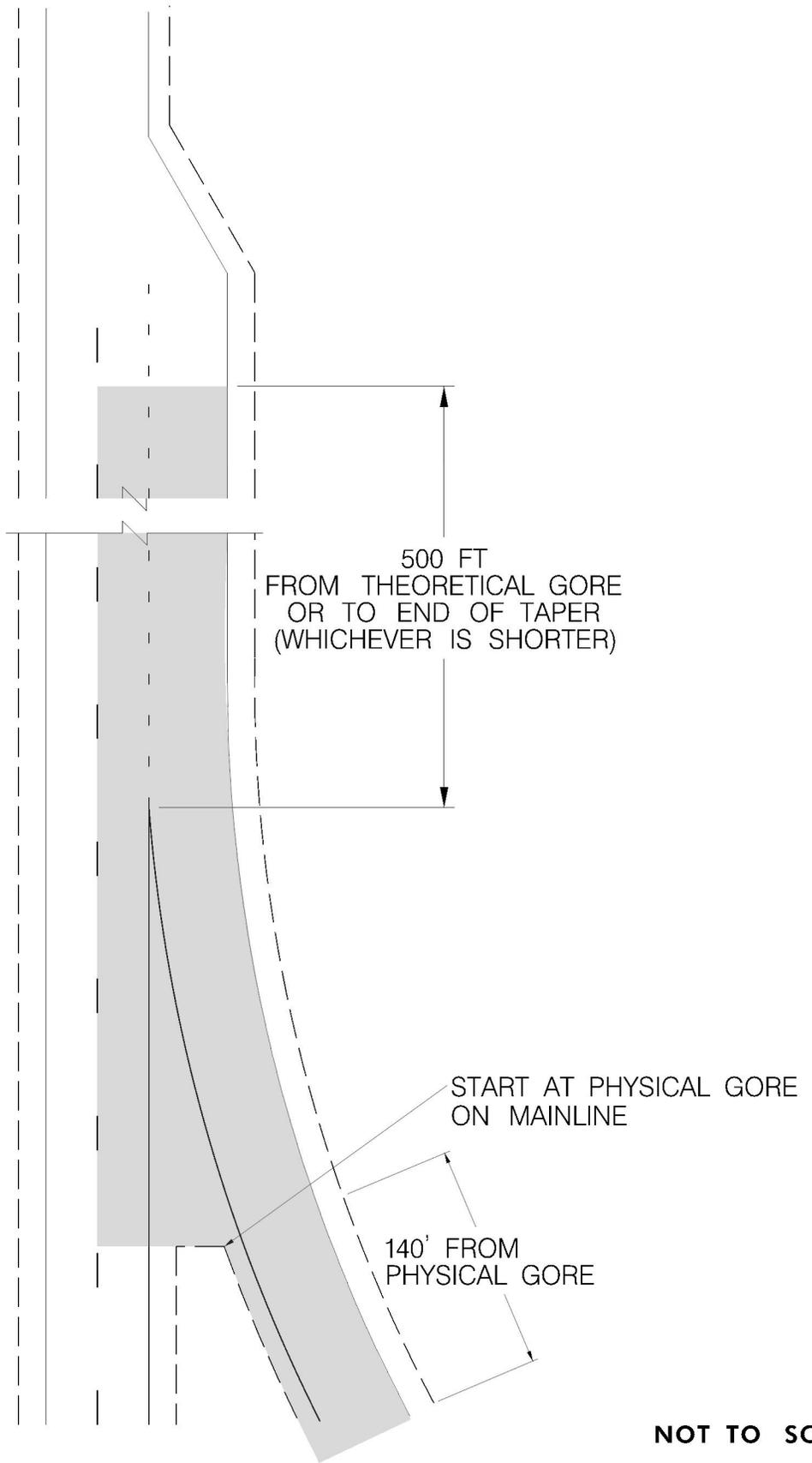
NOTE: DRAWINGS ARE NOT TO SCALE AND THE LIGHT LOCATIONS SHOWN ARE NOT TO BE CONSIDERED COMPLETE IN NUMBER OR BETTER THAN APPROXIMATES IN POSITION.

EXAMPLES OF LIGHTING CONFIGURATIONS



Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
 STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

FIGURE NO.
 III-A.1



NOT TO SCALE

ANALYSIS AREA
FOR ENTRANCE RAMPS

140 FT
FROM PHYSICAL GORE

140 FT
FROM PHYSICAL GORE

500 FT
FROM THEORETICAL GORE
OR TO START OF TAPER
(WHICHEVER IS SHORTER)

NOT TO SCALE

ANALYSIS AREA
FOR EXIT RAMPS



Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

FIGURE NO.
III-A.3

Table III-A.4:

Recommended Lighting Values for Interchanges

Road and Pedestrian Conflict Area ¹		Pavement Classification ² (Minimum Maintained Average Values)			Uniformity Ratio E_{avg}/E_{min}	Veiling Luminance Ratio L_{vmax}/L_{avg}
Road	Pedestrian Conflict Area	R1 (fc)	R2 & R3 (fc)	R4 (fc)		
Freeway Class A		0.6	0.9	0.8	3.0	0.3
Freeway Class B		0.4	0.6	0.5	3.0	0.3
Expressway	High	1.0	1.4	1.3	3.0	0.3
	Medium	0.8	1.2	1.0	3.0	0.3
	Low	0.6	0.9	0.8	3.0	0.3
Major	High	1.2	1.7	1.5	3.0	0.3
	Medium	0.9	1.3	1.1	3.0	0.3
	Low	0.6	0.9	0.8	3.0	0.3
Collector	High	0.8	1.2	1.0	4.0	0.4
	Medium	0.6	0.9	0.8	4.0	0.4
	Low	0.4	0.6	0.5	4.0	0.4
Local	High	0.6	0.9	0.8	6.0	0.4
	Medium	0.5	0.7	0.6	6.0	0.4
	Low	0.3	0.4	0.4	6.0	0.4

¹ Road and Pedestrian Conflict Area as IES RP-8-00 American National Standard Practice for Roadway Lighting.

² Pavement Classifications as IES RP-8-00 American National Standard Practice for Roadway Lighting.



Lighting Design Guidelines

Section III-B.1 Maryland State Highway Administration Roundabout Design Guidelines (Chapter 3)

Chapter 3 - Lighting Guidelines

This section presents recommended guidelines for lighting of roundabouts on facilities within Maryland. The information in this section is based on the following sources:

- FHWA, *NCHRP Report 672: Roundabouts: An Informational Guide - Second Edition*, 2010.
- ANSI / IESNA RP-8-00, *American National Standard Practice for Roadway Lighting*, 2000.
- AS/NZS 1158.1.3:1997, *Road lighting*, Australian/New Zealand Standard, 1997.
- Centre d'Etudes sur les Réseaux les Transports, l'Urbanisme et les constructions publiques (CERTU), *L'Éclairage des Carrefours à Sens Giratoire (The Illumination of Roundabout Intersections)*, Lyon, France: CERTU, 1991.

General Requirements

Lighting should be provided at all roundabouts, whether in rural or urban settings. The specific lighting requirements for each setting are discussed below. Lighting is required for roundabouts on the Maryland state highway system.

Lighting should be installed and operational before the roundabout is open to traffic. If a portion of the roundabout will be opened to accommodate traffic on a temporary basis, lighting should be provided. If permanent lighting cannot be installed to meet construction schedules, temporary lighting will be allowed, with the approval of the engineer.

Lighting in Urban and Suburban Areas

The recommended practice for determining proper roadway illumination is provided in ANSI/IESNA RP-8-00, published by the Illuminating Engineering Society of North America. The discussion in this section focuses on the illuminance method, which is commonly used for illumination design at roundabouts. RP-8-00 discusses other methods such as luminance and small target visibility; the reader is encouraged to refer to that document for discussion of those methods, as well as discussion on the proper method to calculate the critical values for each criterion.

The basic principle behind the lighting of roundabouts in urban and suburban areas is that the amount of light on the roundabout should be equal to the sum of the lighting of the two brightest approach roads. This increases nighttime visibility of the intersection by making it stand out from the approach roadways.

Exhibit 3-1 presents the recommended illuminance for roundabouts located on continuously illuminated streets. Separate values have been provided for portland cement concrete road surfaces (RP-8-00 Road Surface Classification R1) and typical asphalt road surfaces (RP-8-00 Road Surface Classification R2/R3). Exhibit 3-2 presents the roadway and pedestrian area classifications used for determining the appropriate illuminance levels in Exhibit 3-1. RP-8-00

clarifies that although the definitions given in Exhibit 3-2 may be used and defined differently by other documents, zoning by-laws, and agencies, the area or roadway used for illumination calculations should best fit the descriptions contained in Exhibit 3-2 and not how classified by others (RP-8-00, Section 2.0, p.3). Note that the predominant surface type should be used for illumination calculations; for example, a roundabout with an asphalt concrete circulatory roadway and portland cement concrete truck apron should be designed using a surface type of R2/R3.

**Exhibit 3-1
Recommended Illuminance for the Intersection of
Continuously Lighted Urban and Suburban Streets**

Pavement Classification ¹	Roadway Classification	Average Maintained Illuminance at Pavement ²			Uniformity Ratio (E_{avg}/E_{min})	Veiling Luminance Ratio (L_{vmax}/L_{avg})
		Pedestrian/Area Classification				
		High (fc (lux))	Medium (fc (lux))	Low (fc (lux))		
R1	Major/Major	2.4 (24.0)	1.8 (18.0)	1.2 (12.0)	3.0	0.3
	Major/Collector	2.0 (20.0)	1.5 (15.0)	1.0 (10.0)	3.0	0.3
	Major/Local	1.8 (18.0)	1.4 (14.0)	0.9 (9.0)	3.0	0.3
	Collector/Collector	1.6 (16.0)	1.2 (12.0)	0.8 (8.0)	4.0	0.4
	Collector/Local	1.4 (14.0)	1.1 (11.0)	0.7 (7.0)	4.0	0.4
	Local/Local	1.2 (12.0)	1.0 (10.0)	0.6 (6.0)	6.0	0.4
R2/R3	Major/Major	3.4 (34.0)	2.6 (26.0)	1.8 (18.0)	3.0	0.3
	Major/Collector	2.9 (29.0)	2.2 (22.0)	1.5 (15.0)	3.0	0.3
	Major/Local	2.6 (26.0)	2.0 (20.0)	1.3 (13.0)	3.0	0.3
	Collector/Collector	2.4 (24.0)	1.8 (18.0)	1.2 (12.0)	4.0	0.4
	Collector/Local	2.1 (21.0)	1.6 (16.0)	1.0 (10.0)	4.0	0.4
	Local/Local	1.8 (18.0)	1.4 (14.0)	0.8 (8.0)	6.0	0.4

Notes: ¹ R1 is typical for portland cement concrete surface; R2/R3 is typical for asphalt surface

² fc = footcandles

Source: ANSI / IESNA RP-8-00 Table 9 (for R2/R3 values); R1 values adapted from Table 2

**Exhibit 3-2
ANSI / IESNA RP-8-00 Guidance for Roadway and Pedestrian/Area Classification for
Purposes of Determining Intersection Illumination Levels**

Roadway Classification	Description	Daily Vehicular Traffic Volumes¹
Major	That part of the roadway system that serves as the principal network for through-traffic flow. The routes connect areas of principal traffic generation and important rural roadways leaving the city. Also often known as “arterials,” “thoroughfares,” or “preferentials.”	over 3,500 ADT
Collector	Roadways servicing traffic between major and local streets. These are streets used mainly for traffic movements within residential, commercial, and industrial areas. They do not handle long, through trips.	1,500 to 3,500 ADT
Local	Local streets are used primarily for direct access to residential, commercial, industrial, or other abutting property.	100 to 1,500 ADT

Pedestrian Conflict Area Classification	Description	Guidance on Pedestrian Traffic Volumes²
High	Areas with significant numbers of pedestrians expected to be on the sidewalks or crossing the streets during darkness. Examples are downtown retail areas, near theaters, concert halls, stadiums, and transit terminals.	over 100 pedestrians/hour
Medium	Areas where lesser numbers of pedestrians use the streets at night. Typical are downtown office areas, blocks with libraries, apartments, neighborhood shopping, industrial, older city areas, and streets with transit lines.	11 to 100 pedestrians/hour
Low	Areas with very low volumes of night pedestrian usage. These can occur in any of the cited roadway classifications but may be typified by suburban single family streets, very low density residential developments, and rural or semi-rural areas.	10 or fewer pedestrians/hour

Notes: ¹ For purposes of intersection lighting levels only

² Pedestrian volumes during the average annual first hour of darkness (typically 18:00-19:00), representing the total number of pedestrians walking on both sides of the street plus those crossing the street at non-intersection locations in a typical block or 656 ft (200 m) section. RP-8-00 clearly specifies that the pedestrian volume thresholds presented here are a local option and should not be construed as a fixed warrant.

Source: ANSI / IESNA RP-8-00 Sections 2.1, 2.2, and 3.6

Lighting in Rural Areas

Exhibit 3-3 provides recommended illuminance levels for rural isolated intersections with unlit approaches.

Exhibit 3-3
Recommended Illuminance for the Intersection of Unlit Rural Roadways

Pavement Classification¹	Average Maintained Illuminance at Pavement² (fc (lux))	Uniformity Ratio (E_{avg}/E_{min})	Veiling Luminance Ratio (L_{vmax}/L_{avg})
R1	0.6 (6.0)	4.0	0.3
R2/R3	0.9 (9.0)	4.0	0.3

Notes: ¹ R1 is typical for Portland cement concrete surface; R2/R3 is typical for asphalt surface
² fc = footcandles

Source: ANSI / IESNA RP-8-00 Table D1

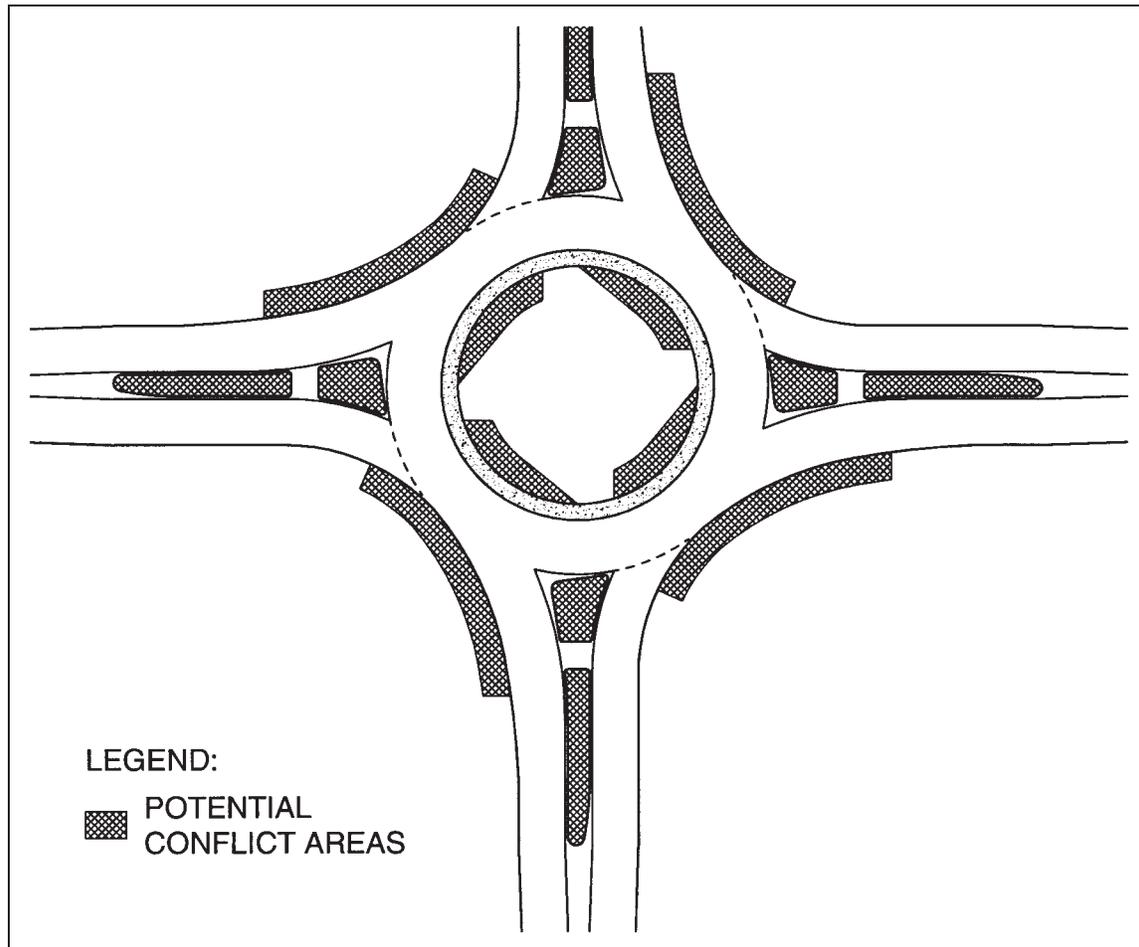
Equipment Type and Location

A photometric analysis is required to determine luminaire wattage, mounting height, luminaire arm length, and pole placement at a roundabout. In general, the use of fewer luminaires with higher wattage mounted on traditional luminaire arms (“cobra-style”) is preferable to minimize the number of fixed objects in the public right-of-way, provided that the IES illuminance requirements are met. However, in urban areas where high pedestrian activity is expected or desirable, pedestrian-level illumination at lower mounting heights is often more consistent with urban design goals and should be considered. These types of luminaires may need to be supplemented by strategically located traditional cobra-style luminaires to provide adequate lighting at key conflict areas.

Lighting on SHA facilities should be installed using SHA standard equipment. Generally, this will involve the use of 40-foot poles with 250-W high-pressure sodium (HPS) “cobra-style” luminaires. If light trespass may be an issue, the designer should consider using 30-foot poles. In some instances, it may be necessary to install lease lighting on utility poles to avoid conflicts with utility lines. If the roundabout is to be installed as part of a community revitalization project or streetscape project, then the type of lighting installed should be complimentary to the lighting being installed throughout the rest of the project.

Exhibit 3-4 suggests critical conflict areas where run-off-the-road crashes are most prevalent at roundabouts. In these areas, lighting poles should be placed as far back from the curb face as practical, and no closer than 3 feet beyond the edge of the traveled roadway. In rural areas where pedestrian activity is low, breakaway pole bases are required for poles located in these critical areas. The placing of lighting in the central island should be avoided; instead, lighting should be placed on the periphery of the roundabout.

**Exhibit 3-4
Critical Conflict Areas Affecting Lighting Pole Placement**



Source: Adapted from AS/NZS 1158.1.3:1997, Road lighting, Australian/New Zealand Standard, 1997, Figure 8.2, p. 39.

Sample Illumination Layouts

The following three exhibits present some sample illumination plans demonstrating layouts using various types of luminaires. Each illumination plan has been customized to the specific geometry of the roundabout, photometric requirements, equipment options, and site constraints. Therefore, the reader is urged to exercise considerable caution if attempting to adapt one or more of these plans to another location.

Exhibit 3-5
Example of Illumination Using Cobra-Style Luminaires

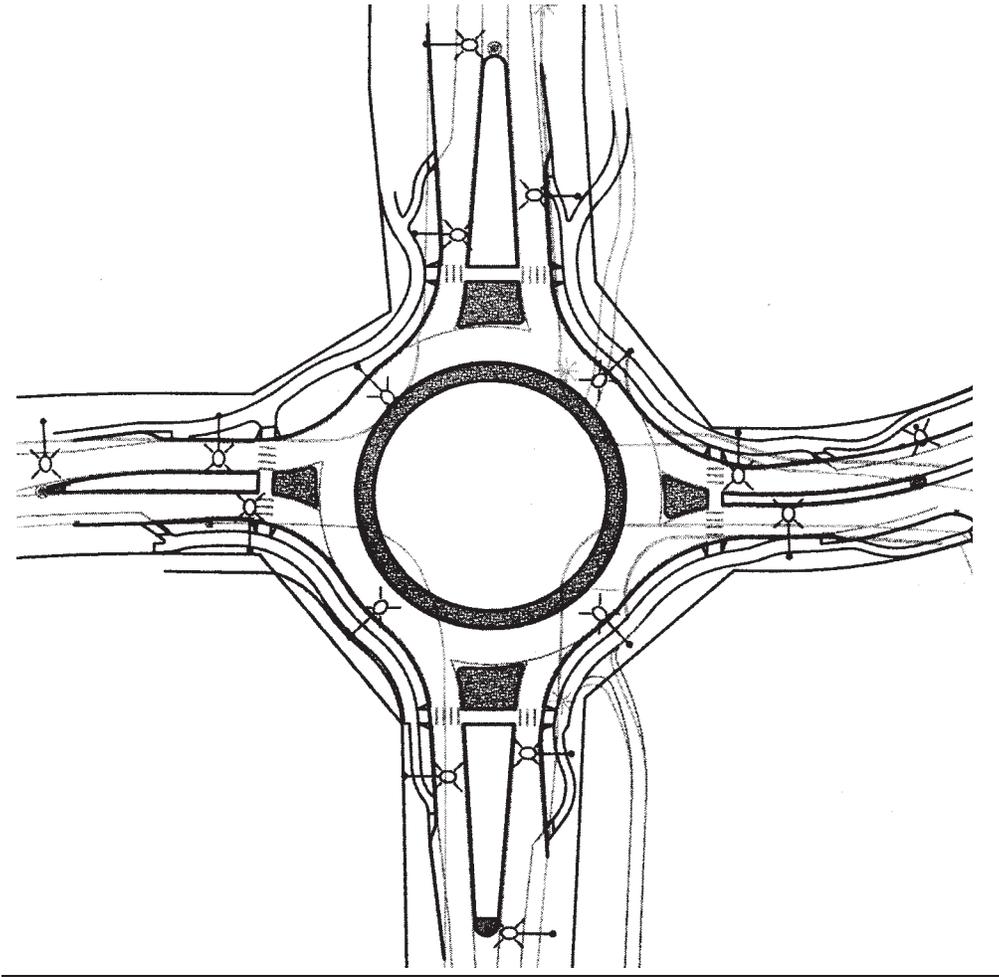


Exhibit 3-6
Example of Illumination Using Pedestrian-Level Luminaires

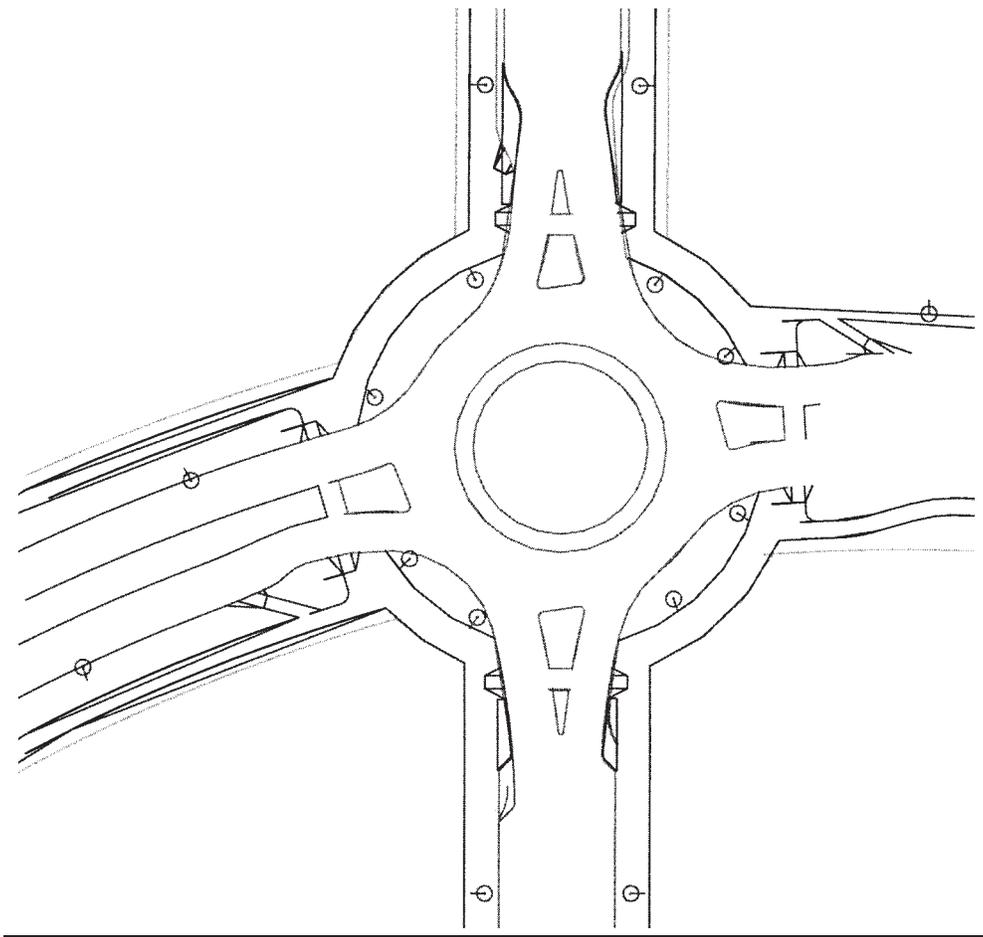


Exhibit 3-7
Example of Illumination Using a Mix of Cobra-Style and Pedestrian-Level Luminaires

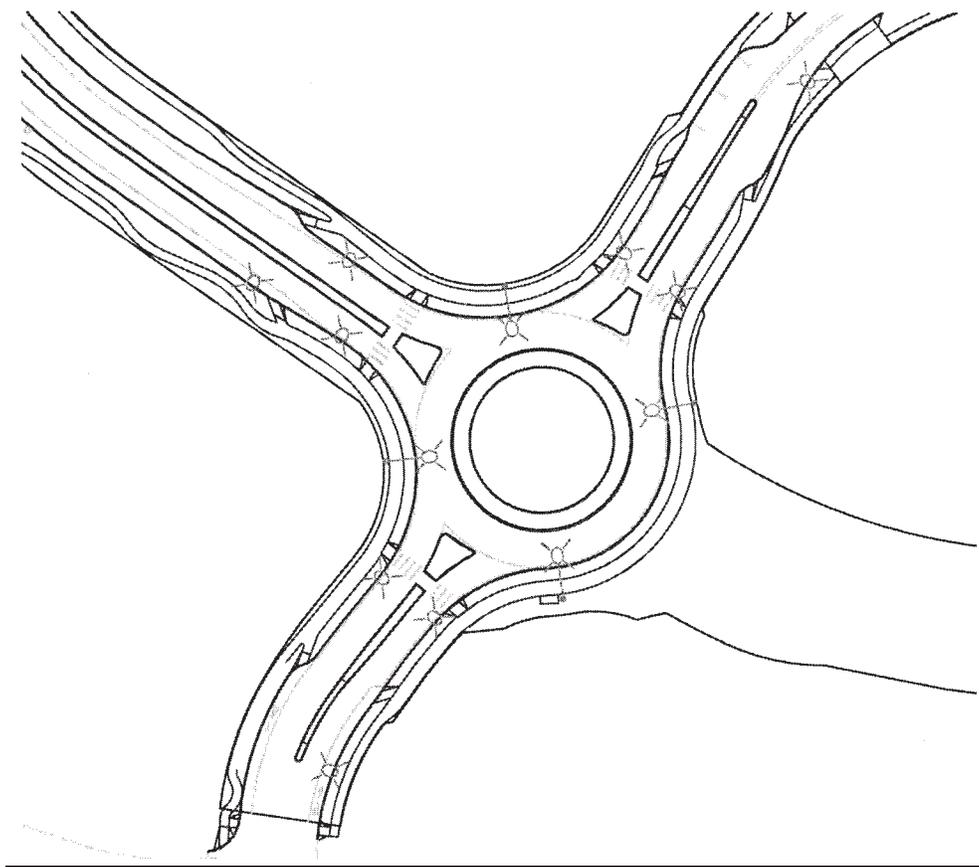


Table III-B.2:

**MARYLAND STATE HIGHWAY ADMINISTRATION
EVALUATION FORM FOR INTERSECTION LIGHTING**

Location:
Evaluation

	Criteria	Score	Weight	Total	
		Met = 1 Not Met = 0 (a)	(b)	(a x b)	
a.	Is intersection signalized?	0	5	0	
b.	Does intersection have medians on any approach?	0	4	0	
c.	Does intersection have left turn bays and /or other auxiliary lanes?	0	3	0	
d.	Is intersection a freeway ramp terminal?	0	4	0	
e.	Is there significant pedestrian volume after dark?	0	3	0	
f.	Does intersection involve two or more state maintained highways?	0	1	0	
g.	Does ADT of state highway exceed 15,000?	0	2	0	
h.	Ratio of Night to total crashes (Min 5 crashes)	0.35-0.40	0	1	0
		0.40-0.45	0	3	0
		0.45-0.50	0	5	0
		> 0.50	0	8	0
i.	Is intersection at school entrance or children walking to school?	0	3	0	
j.	Is operating speed on any road approach greater than 50 MPH?	0	4	0	
k.	Is intersection sight distance restricted?	0	5	0	
l.	Are there any brightly lighted areas, i.e., parking lots, commercial area, etc. within 300 feet of the intersection?	0	4	0	
m.	Are any of the road approaches continuously lighted?	0	4	0	
Total				0	

- 1) Intersection lighting is to be considered by a score of 13 or more.
- 2) Potential for intersection lighting will be prioritized based on score.

Table III-B.3:

Recommended Maintained Illuminance Values for Intersections other than Roundabouts

Road Classification	Pavement Classification ¹			Maximum Uniformity Ratio E_{avg}/E_{min}	Maximum Veiling Luminance Ratio L_{vmax}/L_{avg}
	R1 <i>(fc)</i>	R2 & R3 <i>(fc)</i>	R4 <i>(fc)</i>		
Intersection Lighting²	0.6	0.9	0.8	4.0	0.3

¹ Pavement Classifications as IES RP-8-00 American National Standard Practice for Roadway Lighting.

² Refer to Table 9 of IES RP-8-00 For Recommended Illuminance Lighting Values and Intersections with Continuously Lighting Roadways in Urban Areas.

Table IV-B.1:

Recommended Illuminance Levels for Roadway Rest Areas¹

Rest Area	Average Horizontal Illuminance (fc)	Uniformity Ratio (AVG:MIN)
Entrance and Exit		
Access Lanes	<i>Refer to Table III-A.4</i>	
Gores		
Interior Roadways	0.6	3:1
Activity Areas ²		
Major	1.0	3:1
Minor	0.5	6:1

¹ The illuminance values recommended represent the condition just prior to cleaning and/or group relamping as calculated and planned in the design procedure.

² Activity Areas are not a focus of the SHA OOTS lighting design, however if provided shall meet these values.

Table IV-B.2:

Recommended Maintained Illuminance Values for Parking Areas

Rest Area	Minimum Horizontal Illuminance¹ (fc)	Uniformity Ratio² (MAX:MIN)	Minimum Vertical Illuminance³ (fc)
Basic	0.2	20:1	0.1
Enhanced Security⁴	0.5	15:1	0.25

¹ For preliminary design, an average value of 1 hfc for basic illuminance and 2.5 horizontal footcandles (hfc) for enhanced illuminance may be calculated. The minimum points and maximum point are then calculated and the uniformity ratio checked for compliance with the table's values.

² The highest horizontal illuminance point divided by the lowest horizontal illuminance point or area should not be greater than the values shown.

³ Facial recognition can be made at levels as low as 0.25fc. The IESNA Security Lighting committee recommends that for facial identification, the minimum vertical illuminance should be 0.5fc. This should be measured at 5ft above the surface in various directions.

⁴ If personal security or vandalism is a likely and/or severe problem, a significant increase of the Basic level may be appropriate.

Table IV-C.1:

Recommended Lighting Values for Pedestrian Portion of Underpasses with Walkways/Bikeways

	E_H (fc)	E_{vmin} (fc)	E_{avg}/E_{min}^1
Night	4.0	2.0	3.0
Day²	10.0	5.0	3.0

E_H = Average horizontal illumination at walkway/bikeway

E_{vmin} = Minimum vertical illumination at 1.5 m (4.9 ft) above walkway/bikeway measured in both directions parallel to the main pedestrian flow.

¹ Horizontal only

² Use only when an engineering study indicates that enhanced security lighting is required.



Lighting Design Guidelines

Section IV-E.1 Maryland State Highway Administration Pedestrian Lighting Policy

PEDESTRIAN LIGHTING POLICY
MARYLAND STATE HIGHWAY ADMINISTRATION

In response to the increasing emphasis on urban revitalization programs, the Maryland State Highway Administration (Administration) is placing a new focus on the issue of pedestrian lighting. This focus also aligns with the Department of Transportation's increased emphasis on multi-modal transportation. Pedestrian lighting, when properly designed and installed, has benefits that include enhancing revitalization projects, increasing nighttime pedestrian use and commerce, increasing safety and security, improving aesthetics, and adding to the sense of pride of a community. Pedestrian lighting may also have adverse effects that include glare, light trespass, increased energy consumption and sky glow that should be considered when deciding to install pedestrian lighting. In some instances it may be preferable not to install pedestrian lighting due to environmental, financial or other considerations.

This policy addresses the issues pertaining to the warranting, funding, design, construction, and maintenance of pedestrian lighting systems in which the Administration will be involved. These issues are touched on below and explained in greater detail on the following pages.

While the Administration is proactively seeking to participate in the installation of pedestrian lighting, the Criteria for Eligibility section addresses certain elements that are considered to determine the extent to which it will participate and the priority it will be given. These include the proximity to transit centers, educational and other similar facilities, nighttime pedestrian and business activities, safety and security issues, and the availability of an Administration project as a construction vehicle. In addition, the Local Jurisdiction's commitment to participate in the design, construction, operation and maintenance of the lighting system is a consideration.

The Financial Responsibility section outlines the respective financial responsibilities for the Administration and Local Jurisdictions for the design, construction, and operation and maintenance of pedestrian lighting systems. Given the large selection of poles and fixtures with an equally wide range in prices, along with the flexibility a designer has to vary the number and spacing of fixtures to obtain a desired result, the extent of the Administration's participation will vary.

It is the intent of the Administration to allow flexibility for the Local Jurisdiction with regard to pedestrian lighting systems within given engineering parameters so that the final product will enhance the image of the community, and where necessary maintain historic and aesthetic sensitivity. This sensitivity to individual historical settings will result in variations in pedestrian lighting costs. The Design Standards and Responsibilities section specifies who will perform the design of the system addressing the selection of fixtures, photometric calculations, integration with roadway lighting systems, material specifications, obtaining permits and easement agreements, as well as the review and final approval process.

The Construction section specifies how pedestrian lighting systems will be constructed including who will perform the construction, inspection, and acceptance of the project, as well as the required coordination between contractors and utility companies.

**PEDESTRIAN LIGHTING POLICY
MARYLAND STATE HIGHWAY ADMINISTRATION**

The effectiveness and benefits of the system depend upon periodic maintenance and quick repair of damaged fixtures. It is essential that the local jurisdiction be committed to the long-term upkeep of the pedestrian lighting systems. The Maintenance and Operations section will address the need for a memorandum of understanding between the Administration and the local jurisdiction regarding the requirements and obligations for the maintenance responsibility and energy costs associated with the pedestrian lighting systems.

CRITERIA FOR ELIGIBILITY

The Administration intends to participate in the design and construction of pedestrian lighting systems that are to be included as part of a proposed highway improvement, streetscape, revitalization or other transportation related project where sidewalks are either present or to be installed. The following criteria are to be considered in determining where pedestrian lighting may be utilized most effectively.

1. The system is within ½ mile of a transit center or ¼ mile of a major transit stop or is along a connection between two or more transit centers.
2. The system falls within a designated urban revitalization area.
3. The system is within ½ mile of an educational or similar facility that generates significant pedestrian traffic during hours of darkness.
4. The total number of pedestrians and/or bicyclists within any one-hour period of darkness is relatively high.
5. The system is within a commercial area with significant nighttime activities.
6. Pedestrian safety issues have been documented.

FINANCIAL RESPONSIBILITY

Administration Financial Responsibilities:

In general, when pedestrian lighting is warranted, the Administration will participate in the costs associated with design and construction of a pedestrian lighting system in one of its transportation related projects. However, due to the wide range of available styles, materials, poles, and fixtures, the Administration has established a limit for participation in the construction/installation. SHA's participation will be contingent upon the local jurisdiction's acceptance of the following conditions:

1. SHA will be responsible for the design costs of the pedestrian lighting system when the lighting system is designed by SHA or its consultants. SHA will not participate in design costs incurred by other entities other than a regulated public utility.

PEDESTRIAN LIGHTING POLICY
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2. SHA will be responsible for the costs associated with the installation of the pedestrian lighting infrastructure. For purposes of this policy, infrastructure is defined as conduits and handboxes.
3. SHA will fund 50% of the actual cost to furnish and install the wiring, light foundations, poles, standard light fixtures, luminaires, and lighting control cabinets, including metered service pedestals. The limits of SHA participation will be based upon a basic lighting system that is in conformance with the design standards noted elsewhere in this policy.
4. The local jurisdiction may select lighting fixtures of a more ornamental style they find in keeping with the local community's environment or theme. Any additional costs associated with the selected lights will be the responsibility of the local jurisdiction. These selections must meet the design standards stated herein.
5. The purchase of the lighting systems and their installation will be accomplished through the State of Maryland Procurement process. Separate purchase by the local jurisdiction will not be subject to participation by the Administration, except as part of an agreement with a regulated public utility for long term maintenance.
6. The local jurisdiction agrees to maintain the lighting system.

The Administration will be responsible for all costs of lighting associated with intersections of public roads where engineering studies indicate there is a significant safety risk involving vehicles. This lighting will be provided using equipment acceptable to the Administration.

Local Jurisdiction Financial Responsibilities

The local jurisdiction will assume operational and maintenance costs for the pedestrian lighting system. This includes energy costs, maintenance and damage repair or replacement. A Memorandum of Understanding or a signed letter of intent from the local jurisdiction must be obtained before the project is advertised.

1. The local jurisdiction will be responsible for funding 50% of the actual cost to furnish and install the wiring, light foundations, poles, standard light fixtures, luminaires, and lighting control cabinets, including metered service pedestals for a basic lighting system.
2. The local jurisdiction will be responsible for funding 100% of the increased cost associated with any ornamental style poles or fixtures.
3. The local jurisdiction will be responsible for any utility connection charges from the local utility company.
4. Should the local jurisdiction elect to purchase and install pedestrian lights subsequent to the construction of the highway improvement project, SHA will install the infrastructure as specified under condition 2 of Administration Financial Responsibilities. The local jurisdiction will be required to install the pedestrian lighting systems within 3 years of the completion of the highway project. Should the local jurisdiction fail to install an operational pedestrian lighting system within this time frame, SHA will make deductions from the local jurisdictions share of Highway User Funds equal to the cost of the installed infrastructure and system design costs incurred by SHA.

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MARYLAND STATE HIGHWAY ADMINISTRATION**

5. In some instances, at the request of the local jurisdiction, the local utility company may do the design and construction of the pedestrian lighting. In such instances, the local jurisdiction shall be responsible for all design, furnishing, installation, energy, maintenance, and amortized design and construction costs.
6. The local jurisdiction shall be responsible for any accessory equipment not required for the lighting system. This includes additional wiring and fixtures for the installation of outlets within the poles, banner attachments, etc.

DESIGN STANDARDS

The factors that shall be considered when designing pedestrian lighting are:

- The “theme” of the community as defined by previous projects, by historical considerations, or by the vision of the community.
- The environmental effect of the lighting including glare, light trespass, sky glow, and, energy and maintenance costs.
- The Illuminating Engineering Society of North America recommendations and design levels for pedestrian walkways.
- State and federal safety design guidelines.
- The National Electric Code requirements.
- Adverse effects on vehicles on the traveled roadway including light trespass on the road, and glare or veiling luminance for the driver.
- Local utility company requirements and capabilities.
- Right of way and easement needs.

DESIGN RESPONSIBILITIES

Administration Responsibilities

In all cases, the Administration will review and approve the design of a pedestrian lighting system to be constructed under an Administration Contract, or in Administration right of way.

The Administration will provide design services for the lighting, electrical system and other lighting infrastructure needs where not provided by the local utility company or an agent of the local jurisdiction. As noted above SHA will only participate in design costs provided by a

PEDESTRIAN LIGHTING POLICY MARYLAND STATE HIGHWAY ADMINISTRATION

regulated public utility. SHA design efforts will include coordination with pertinent agencies including the Maryland Historical Trust.

Other agencies that may design pedestrian lighting systems are:

- The local utility company. Many of the local utility companies are proficient in the design and installation of lighting.
- The local jurisdiction or their consultant. Often it is beneficial for the local jurisdiction to engage a consultant who is familiar with the many sources of lighting supplies, and who can guide them in making a choice that is aesthetically acceptable. Many suppliers will provide these services free of charge.

Local Jurisdiction Responsibilities:

The local jurisdiction will be responsible for identifying the style of lighting desired.

The local jurisdiction will be responsible for determining the limits of the lighting provided they meet the criteria noted above. Note that these may not exceed the limits stated in this policy.

The local jurisdiction will be responsible for determining, if they wish, for the local utility company to design and install the lighting.

The local jurisdiction will be responsible for determining how they anticipate having maintenance performed. If the local utility is to maintain the lighting, this may impact the design standards to be used.

The local jurisdiction will be responsible for completing the items above, and requesting that pedestrian lighting be included prior to the completion of 30% plans (Preliminary Investigation) by the Administration. The Administration can not initiate a design or switch from a utility company design to Administration design after the project has reached this level of completion.

The local jurisdiction will be responsible for obtaining needed easements or right of way for the lighting by a sidewalk ordinance or other means. This must be completed before the project is advertised. Failure by the local jurisdiction to obtain the necessary right-of-way prior to the scheduled advertisement date will result in the removal of the pedestrian lighting system from the contract.

CONSTRUCTION

There are three scenarios for installing pedestrian lighting systems:

PEDESTRIAN LIGHTING POLICY
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1. The Administration's contractor shall install the system as part of their construction contract. The Administration will be responsible for advertising and awarding the contract including plans and specifications for the pedestrian lighting system. It will also administer the contract, approve materials and perform construction inspection of the system. Final acceptance of the system will be the responsibility of the Administration in conjunction with the local jurisdiction.
2. Where available, the local jurisdiction may opt to have the local utility company install the pedestrian lighting system. This is most often accomplished when the lighting is to be leased from the utility company or when the local jurisdiction has made arrangements with the utility company to maintain the system. The Administration will be responsible for the coordination of work by the utility company with that of the prime contractor performing the transportation project.
3. Subject to prior agreement, the SHA will install the infrastructure (handboxes and conduit) as a part of the SHA construction project. The local jurisdiction will then contract separately for completion of the system within 3 years of construction completion on SHA's project.

MAINTENANCE

The local jurisdiction will be required to enter into a maintenance agreement with the Administration to assume all associated maintenance costs, and ensure that routine maintenance and damage repair and replacement is performed in a timely manner. The jurisdiction may perform the maintenance with its own forces, through a contract agreement with an electrical maintenance contractor, or through the local utility company where available. Details regarding energy costs, the timeliness of repairs, and the percentage of lights to be operational at all times will be specified in the maintenance agreement.

APPROVED:



Administrator
Maryland State Highway Administration

9/9/08

Date

Table IV-E.2:

Recommended Maintained Illuminance Values for High Pedestrian Conflict Areas¹

	E_H (fc)	E_{vmin} (fc)	E_{avg}/E_{min}[*]
Mixed Vehicle and Pedestrian^{**}	2.0	1.0	4.0
Pedestrian	1.0	0.5	4.0

Table IV-E.3:

Recommended Maintained Illuminance Values for Medium Pedestrian Conflict Areas¹

	E_H (fc)	E_{vmin} (fc)	E_{avg}/E_{min}[*]
Pedestrian	0.5	0.2	4.0

Table IV-E.4:

Recommended Maintained Illuminance Values for Low Pedestrian Conflict Areas¹

	E_H (fc)	E_{vmin} (fc)	E_{avg}/E_{min}[*]
Rural/Semi-Rural Areas	0.2	0.06	10.0
Low Density Residential	0.3	0.08	6.0
Medium Density Residential	0.4	0.1	4.0

* Horizontal

**Mixed vehicle and pedestrian refers to those areas where the pedestrians are immediately adjacent to vehicular traffic without barriers or separation. Does not apply to mid-block crossings.

E_H=Average horizontal illuminance at walkway/bikeway

E_{vmin} = Minimum vertical illumination at 1.5 m (4.9 ft) above walkway/bikeway measured in both directions parallel to the main pedestrian flow.

¹ Pedestrian Conflict Areas as defined in IES RP-8-00 American National Standard Practice for Roadway Lighting.

CRITERIA

THE CONTRACTOR SHALL BE GOVERNED BY THE STANDARDS AND REQUIREMENTS OF THE FOLLOWING PUBLICATIONS, EXCEPT AS MODIFIED BY THE SPECIAL PROVISIONS OF THIS CONTRACT:

DESIGN

MDOT SHA - "MARYLAND MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", 2011 EDITION AND SUBSEQUENT REVISIONS. (MDMUTCD)

A A S H T O - "HIGHWAY SAFETY DESIGN AND OPERATIONS GUIDE" -1997

A A S H T O - "STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS LUMINAIRES AND TRAFFIC SIGNALS", 2001 EDITION (CATEGORY II FOR ALL OVERHEAD AND CANTILEVER SIGN STRUCTURES).

MATERIALS AND CONSTRUCTION

MDOT SHA - "STANDARD SPECIFICATIONS FOR CONSTRUCTION & MATERIALS", 2017 EDITION AND SUBSEQUENT REVISIONS AND SUPPLEMENTS.

DESIGN WIND

- 100 MPH - WOOD SUPPORTS
10 YEAR RECURRENCE INTERVAL
 - 100 MPH - GROUND MOUNT SIGN STEEL SUPPORTS
10 YEAR RECURRENCE INTERVAL
 - 100 MPH - OVERHEAD AND CANTILEVER STRUCTURES
50 YEAR RECURRENCE INTERVAL
- } ALL DISTRICTS

DESIGN STRESS

SOIL BEARING PRESSURE - S = 3,000 P.S.F. (ASSUMED)
SEE MATERIAL & CONSTRUCTION ABOVE AND SPECIAL PROVISIONS FOR DESIGN STRESSES FOR STRUCTURAL STEEL, ALUMINUM, REINFORCING STEEL AND CONCRETE.

CHAMFER

ALL EXPOSED EDGES OF CONCRETE SHALL HAVE A 3/4" X 3/4" CHAMFER.

CLASSIFICATION OF SIGNS

SIGNS ARE DIVIDED INTO TWO (2) GENERAL CATEGORIES.

1. GUIDE SIGNS

- A) STRUCTURAL TYPES
 - OH - OVERHEAD
 - C - CANTILEVER
 - GM - GROUND MOUNT, BREAKAWAY OR NON-BREAKAWAY
 - BM - BRIDGE MOUNTED
- B) PANELS
 - MATERIAL - EXTRUDED ALUMINUM
 - COPY - DIRECT APPLIED
- I) HIGH INTENSITY (NEW SIGNS AND REVISIONS TO EXISTING SIGNS)

2. STANDARD SIGNS (REGULATORY, WARNING, ETC.)

- A) STRUCTURAL TYPES
 - WOOD SUPPORTS
 - SQUARE TUBE
- B) PANELS
 - MATERIAL - SHEET ALUMINUM
 - COPY - DIRECT APPLIED

IDENTIFICATION OF SIGNS AND PANELS

GUIDE SIGNS

EACH GUIDE SIGN IS IDENTIFIED BY A SIGN NUMBER ON THE PLANS AND IN THE TABULATIONS. (GM-1, GM-2, GM-3, etc)
SIGNS ON STRUCTURES ARE IDENTIFIED WITH A NUMBER AND WHERE VARIATIONS OCCUR, A LOWER CASE LETTER. (OH-1a, OH-1b, OH-1c)

STANDARD SIGNS

STANDARD SIGNS ARE IDENTIFIED BY PANEL NUMBERS AND ARE CLASSIFIED AS FOLLOWS
R - REGULATORY
W - WARNING
M - ROUTE MARKERS AND ACCESSORIES
D - DESTINATION AND MILEAGE PANELS
S - SCHOOL

PANELS SHALL BE DESIGNATED TO AGREE WITH MARYLAND STANDARD SIGN BOOK. EACH STANDARD SIGN IS IDENTIFIED FIRST BY THE SHEET NUMBER, THEN BY THE NUMERICAL ORDER OF THE SIGN AS IT APPEARS ON THE PLAN.
FOR EXAMPLE SHEET SN 2.1-101,102,103, ETC. SHEET SN 2.2-201,202,203,ETC.

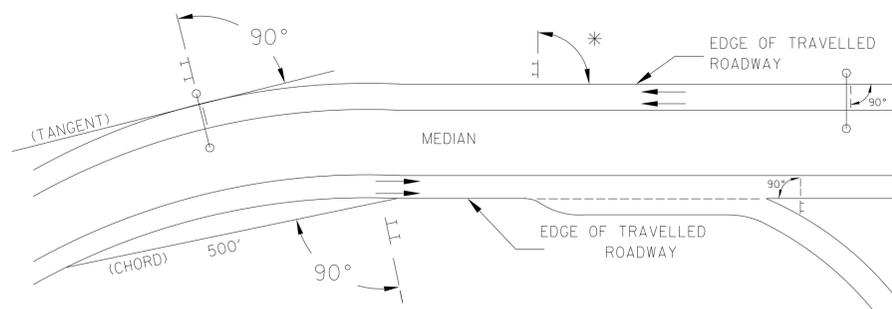
PANEL LAYOUT AND ALPHABETS

1. GUIDE SIGN PANEL LAYOUTS ARE BASED ON THE A.A.S.H.T.O. MANUALS NOTED ABOVE.
2. STANDARD SIGN PANEL LAYOUTS ARE BASED ON THE MDMUTCD WITH SPECIFICATIONS DETAILED IN THE MARYLAND STATE HIGHWAY ADMINISTRATION PUBLICATION, "STANDARD SIGN BOOK", AVAILABLE ONLINE AT http://apps.roads.maryland.gov/businesswithsha/bizstdsspecs/desmanualstdpub/publicationsonline/oofs/internet_signbook.asp

REFLECTORIZATION

BACKGROUNDS, BORDERS, TEXTS AND ALL OTHER ELEMENTS OF SIGN PANELS SHALL BE REFLECTORIZED EXCEPT WHERE NOTED. REFER TO PROJECT REQUIREMENTS FOR MORE DETAIL.

ORIENTATION OF SIGN FACES



* UNDER 30 FEET FROM TRAVELLED ROADWAY TO NEAR EDGE OF SIGN - 93° AWAY FROM THE ROAD TO AVOID SPECULAR REFLECTION AS INDICATED IN 813.03 OF THE MARYLAND STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MATERIALS.
OVER 30 FEET FROM TRAVELLED ROADWAY TO NEAR EDGE OF SIGN - 90°

SIGN LOCATIONS

1. GUIDE SIGNS ARE LOCATED ON THE PLANS BY DIMENSION TO SURVEY STATIONS, OR WHEN NECESSARY, TO IDENTIFIABLE PHYSICAL FEATURES.
2. ALL CHANGES IN THE LOCATIONS OF SIGNS AS SHOWN ON THE PLAN SHALL HAVE THE PRIOR APPROVAL OF THE ENGINEER.

EXISTING UTILITIES

THE ENGINEER DOES NOT WARRANT OR GUARANTEE THE ACCURACY OR COMPLETENESS OF UTILITY INFORMATION SHOWN ON THE PLAN. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE AND PROTECT ALL EXISTING FACILITIES WHICH MIGHT BE AFFECTED BY THIS WORK OR HIS OPERATION.

ROADSIDE SIGNS

1. VERTICAL ALIGNMENT
POSITION PANEL SO FACE IS PLUMB.
2. HORIZONTAL ALIGNMENT (SEE DIAGRAM ABOVE)
 - A) ON STRAIGHT ROADWAY SECTIONS, ANGLE OF SIGN FACE TO ROADWAY VARIES WITH DISTANCE FROM TRAVELLED ROADWAY TO NEAR EDGE OF SIGN - SEE DIAGRAM.
 - B) ON THE INSIDE OF HORIZONTAL CURVES, POSITION SIGN SO FACE OF PANEL MAKES AN ANGLE OF 90° WITH A CHORD BETWEEN A POINT ON NEAR EDGE OF PAVEMENT AT SIGN LOCATION AND A POINT ON EDGE OF PAVEMENT 500' IN ADVANCE OF SIGN.
 - C) ON THE OUTSIDE OF HORIZONTAL CURVES, POSITION SIGN SO FACE OF PANEL IS AT RIGHT ANGLES TO THE TANGENT OF THE CURVE AT THE SIGN LOCATION.
 - D) POSITIONING OF SIGNS AT GORES AND RAMP SEPARATIONS IS REFERRED TO THE NORMAL EDGE OF THE MAINLINE ROADWAY.

OVERHEAD SIGNS

1. VERTICAL ALIGNMENT
POSITION PANELS FOR ALL OVERHEAD STRUCTURES SO THAT PANEL FACE IS PLUMB.
2. OVERHEAD SIGN STRUCTURES SHALL NOT BE ERRECTED WITHOUT ATTACHING LUMINAIRES, SUPPORTS, AND/OR SIGNS.
3. HORIZONTAL ALIGNMENT
 - A) POSITION ALL OVERHEAD SIGNS SO THAT THE FACE OF THE PANEL IS AT RIGHT ANGLES TO THE NORMAL EDGE OF ROADWAY, IF ON A STRAIGHT ROADWAY SECTION.
 - B) POSITION ALL OVERHEAD SIGNS SO THAT THE FACE OF THE PANEL IS AT RIGHT ANGLES TO THE TANGENT OF THE CURVE AT SIGN LOCATION, IF ON A HORIZONTAL CURVE.
 - C) POSITIONING OF SIGNS AT GORES AND RAMP SEPARATIONS IS REFERRED TO THE NORMAL EDGE OF THE MAINLINE ROADWAY.
4. VERTICAL CLEARANCE
 - A) OVERHEAD SIGNS SHALL HAVE A MINIMUM VERTICAL CLEARANCE OF 17'-9" FROM ROADWAY TO THE BOTTOM OF LIGHT FIXTURES. ALL LIGHT FIXTURES ARE TO BE AT THE SAME ELEVATION.
 - B) IF THE CONTRACTOR CANNOT OBTAIN 17'-9" (SEE 3A) CLEARANCE, HE IS TO CEASE WORK AND CONTACT THE PROJECT ENGINEER FOR FURTHER INSTRUCTIONS. THE PROJECT ENGINEER MAY CONTACT THE TRAFFIC ENGINEERING DESIGN DIVISION FOR ASSISTANCE.
 - C) ON ALL OVERHEAD SIGNS, THE MINIMUM CLEARANCE TO BOTTOM OF SIGN: 20'-9".

PROJECT REQUIREMENTS

ALL NEW SIGNS ON THIS PROJECT SHALL BE FABRICATED FROM SHEETING WHICH MEETS ALL OF THE FOLLOWING REQUIREMENTS, UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENTS, OR AS DIRECTED BY THE ENGINEER:

1. SHEETING SHALL MEET THE REQUIREMENTS OF SECTIONS 813 AND 950.03 OF MDOT SHA'S STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MATERIALS 2017 EDITION AND SUBSEQUENT REVISIONS AND SUPPLEMENTS.
2. LISTED ON MDOT SHA OFFICE OF TRAFFIC AND SAFETY'S QUALIFIED PRODUCTS LIST (OPL).

PROJECT REQUIREMENTS CONT'D

3. THE FOLLOWING TYPES OF SHEETING SHALL BE USED FOR THE SPECIFIED SIGN CLASSIFICATIONS:

GENERAL NOTE: ALL COLORS SHALL BE RETROREFLECTIVE EXCEPT BLACK. BLACK TEXT, BORDERS, SYMBOLS OR ANY BLACK ELEMENTS OF ANY SIGN SHALL BE NON-REFLECTIVE. THIS APPLIES TO ALL MDOT SHA SIGNS AS SHOWN BELOW.

A) GUIDE, EXIT GORE, GENERAL INFORMATION, AND SERVICE SIGNS - FALL INTO TWO SUB CATEGORIES:

- (I). GROUND MOUNTED:
ALL RETROREFLECTIVE SHEETING ELEMENTS OF THESE SIGNS SHALL MEET OR EXCEED THE REQUIREMENTS FOR ASTM TYPE IX (9).
- (II). OVERHEAD STRUCTURE SIGNS AND OVERHEAD CANTILEVER SIGNS:
ALL RETROREFLECTIVE SHEETING ELEMENTS OF ALL OVERHEAD SIGNS SHALL MEET OR EXCEED THE REQUIREMENTS FOR ASTM TYPE XI(II). (THIS SECTION DOES NOT APPLY TO OVERHEAD SIGNALIZED INTERSECTION SIGNING; MAST ARM OR SPAN WIRE. FOLLOW THE REQUIREMENTS FOR THE RESPECTIVE SIGN CLASSIFICATION FOR SIGNAL SIGNING.)

B) WARNING SIGNS - RETROREFLECTIVE SHEETING FOR WARNING SIGNS (FLUORESCENT YELLOW AND FLUORESCENT ORANGE) SHALL MEET OR EXCEED THE REQUIREMENTS FOR ASTM TYPE IX (9). REGULATORY MESSAGES WITHIN WARNING SIGNS SHALL FOLLOW THE REQUIREMENTS FOR REGULATORY SIGNS.

C) SCHOOL SIGNS - RETROREFLECTIVE SHEETING FOR SCHOOL SIGNS (FLUORESCENT YELLOW AND FLUORESCENT YELLOW-GREEN) SHALL MEET OR EXCEED THE REQUIREMENTS FOR ASTM TYPE IX (9). REGULATORY MESSAGES WITHIN SCHOOL SIGNS SHALL FOLLOW THE REQUIREMENTS FOR REGULATORY SIGNS.

D) REGULATORY SIGNS - FALL INTO THREE SUBCATEGORIES:

- (I). "RED" REGULATORY SIGNS; (SPECIFICALLY - STOP, YIELD, DO NOT ENTER AND WRONG WAY). ALL RETROREFLECTIVE SHEETING ELEMENTS OF THESE SIGNS SHALL MEET OR EXCEED THE REQUIREMENTS FOR ASTM TYPE IX (9).
- (II). ALL R7 AND R8 SERIES PARKING RELATED SIGNS AND THEIR SUPPLEMENTAL PANELS, NO TRESPASSING SIGNS, AND SIGNS DIRECTED AT PEDESTRIANS AND BICYCLISTS ONLY. ALL RETROREFLECTIVE SHEETING ELEMENTS OF THESE SIGNS SHALL MEET THE REQUIREMENTS FOR ASTM TYPE IV (4).
- (III). ALL OTHER REGULATORY SIGNS - ALL RETROREFLECTIVE SHEETING ELEMENTS OF THESE SIGNS SHALL MEET ASTM TYPE IV (4) INCLUDING RED ELEMENTS. WARNING MESSAGES WITHIN REGULATORY SIGNS SHALL FOLLOW THE REQUIREMENTS FOR WARNING SIGNS.

E) ROUTE MARKERS (INDEPENDENT USE AND GUIDE SIGN USE)

INDEPENDENT USE: ALL RETROREFLECTIVE SHEETING ELEMENTS OF THESE SIGNS SHALL MEET BUT NOT TO EXCEED THE REQUIREMENTS FOR ASTM TYPE IV (4).

GUIDE SIGN USE: WHEN INCORPORATED IN THE BODY OF A GUIDE SIGN, ALL RETROREFLECTIVE SHEETING ELEMENTS OF THESE SIGNS SHALL MEET THE SHEETING REQUIREMENTS OF THE GUIDE SIGNS FOR WHICH THEY ARE TO BE APPLIED; GROUND MOUNT ASTM TYPE IX (9) OR OVERHEAD ASTM TYPE XI(II).

F) LOGOS AND / OR GRAPHICS - WITHIN SIGNS SHALL FOLLOW THE REQUIREMENTS FOR THE RESPECTIVE SIGN CLASSIFICATION UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENTS, OR AS DIRECTED BY THE ENGINEER.

G) SPECIFIC SERVICE (LOGO) SIGNING - ALL COPY, DIVIDER BORDERS, LOGOS AND ARROWS SHALL BE DEMOUNTABLE ALUMINUM OVERLAYS. .032 MINIMUM TO .063 MAXIMUM. ALL RETROREFLECTIVE SHEETING ELEMENTS OF THESE SIGNS SHALL MEET OR EXCEED THE REQUIREMENTS FOR ASTM TYPE IX (9). DISTANCES ON DIRECTIONAL ARROWS WHEN SPECIFIED SHALL BE BLACK. THE OVERLAYS ARE TO BE APPLIED WITH .125 ALUMINUM POP RIVETS TO THE BODY OF THE MAIN SIGN.

H) CIVIL DEFENSE SIGNS AND OTHER SIGNS - NOT SPECIFICALLY FALLING INTO ONE OF THE CATEGORIES ABOVE, SHALL FOLLOW THE GUIDELINES FOR THE SIGN CLASSIFICATION THAT MOST CLOSELY MATCHES THE COLOR(S) OF THE PROPOSED SIGN.

4. THE FOLLOWING MINIMUM THICKNESS SHALL BE USED FOR THE APPROPRIATE WIDTH OF SHEET ALUMINUM BLANKS:

LONGEST DIMENSION	MINIMUM THICKNESS
UP TO 12"	0.040"
GREATER THAN 12" TO 24"	0.063"
GREATER THAN 24" TO 36"	0.080"
GREATER THAN 36" TO 48"	0.100"
OVER 48"	0.125"

OFFICE OF TRAFFIC & SAFETY
TRAFFIC ENGINEERING DESIGN DIVISION

MDOT
MARYLAND DEPARTMENT
OF TRANSPORTATION
STATE HIGHWAY
ADMINISTRATION

<PROJECT NAME>
<PROJECT DESCRIPTION LINE 1>
<PROJECT DESCRIPTION LINE 2>
<PROJECT DESCRIPTION LINE 3>
<PROJECT DESCRIPTION LINE 4>
<PROJECT DESCRIPTION LINE 5>

APPROVALS		REVISIONS		GENERAL NOTES AND PROPOSALS	
TEAM LEADER				SCALE _____ ADVERTISED DATE _____ CONTRACT NO. <CONTRACT_NO>	
ASST. DIV. CHIEF				DESIGNED BY _____ COUNTY _____ <COUNTY>	
DIVISION CHIEF				DRAWN BY _____ LOGMILE _____	
OFFICE DIRECTOR				CHECKED BY _____ TIMS NO. _____	
				MDE/PRD <00-AA-0000> TOD NO. _____	
				DRAWING NO. _____ OF _____ SHEET NO. _____ OF # _____	

PLACE
CONSULTANT
LOGO HERE

BY: mosborne